IN THE CLAIMS

This listing of claims will replace all prior versions, and listings of claims in the Application.

1. (Currently amended): A microfluidic device, comprising:

a source fluid flow channel;

a target fluid flow channel, the target fluid flow channel being in fluid communication with the source fluid flow channel at a cross-channel area, wherein the source fluid flow channel crosses over the target fluid flow channel in an X fashion at the cross-channel area;

a porous membrane separating the source fluid flow channel from the target fluid flow channel in the cross-channel area, wherein the porous membrane comprises a porous silicon membrane;

a substrate comprising an upper substrate member and a lower substrate member; and

a field-force/gradient mechanism proximate the porous silicon membrane, wherein the field-force/gradient mechanism comprises an electric field configured to produce a fluid movement of a fluid from the source fluid flow channel to the target fluid flow channel via the porous silicon membrane located in the cross-channel area,

wherein the porous silicon membrane ~~is configured to produce~~produces a change in both an optical characteristic and an electrical characteristic of the porous silicon membrane and wherein the porous silicon membrane is a sensor exhibiting sensing

characteristics causing a change in at least one of the optical characteristic and the electrical characteristic in response to exposure to a targeted fluid or reaction, wherein the source fluid flow channel is within the upper substrate member and the target fluid flow channel is within the lower substrate member, wherein the upper substrate member comprises a first cavity and the lower substrate member a second cavity, and wherein porous silicon membrane is located in a hollow space formed by the first and second cavities.

2. – 9. (Canceled).

10. (Original): The device of Claim 1, further comprising a light source and a detector, the light source and the detector being focused at the cross-channel area.

11. (Currently amended): The device of Claim 1, wherein the thickness of the porous silicon membrane is between 0.01 and 50 micrometers.

12. (Currently amended): The device of Claim 1, wherein the porous silicon membrane is capable of fractionating molecules based on size, molecular weight, charges, chemical affinity or other chemical/physical properties.

13. (Currently amended): The device of Claim 1, wherein the porous silicon membrane is made of a single crystal porous silicon (Psi).

14. (Currently amended): The device of Claim 1, wherein the porous silicon membrane is made of a porous polysilicon (PPSi).

15. (Previously Presented): The device of Claim 1, the source fluid flow channel and the target fluid flow channel being formed in the substrate.

16. (Original): The device of Claim 15, wherein the substrate is made of polydimethyl siloxane (PDMS).

17. (Original): The device of Claim 15, wherein the substrate is made of silicon.

18. (Canceled).

19. (Original): The device of Claim 1, wherein the device is a disposable device.

20. (Original): The device of Claim 1, wherein the device is a reusable device.

21. (Original): The device of Claim 1, wherein the source fluid flow channel and the target fluid flow channel intersect at a 90 degree angle at the cross-channel area.

22. (Currently amended): A microfluidic molecular-flow fractionator device comprising:

a substrate, the substrate including:

one or more source fluid flow channels;

one or more target fluid flow channels in fluid communication with the one or more source fluid flow channels; and

one or more cross-channel areas at the intersection of each source fluid flow channel and each target fluid flow channel, wherein the source fluid flow channel crosses over the target fluid flow channel in an X fashion at the cross-channel area;

a porous membrane positioned in each cross-channel area separating the source fluid flow channels from the target fluid flow channels, wherein the porous membrane comprises a porous silicon membrane; and

a field-force/gradient mechanism proximate the porous silicon membrane, wherein the field-force gradient mechanism comprises an electric field configured to produce a fluid movement of a fluid from the source fluid flow channel to the target fluid flow channel via the porous silicon membrane located in the cross-channel area,

wherein the porous silicon membrane ~~is configured to produce~~produces a change in both an optical characteristic and an electrical characteristic of the porous silicon membrane and wherein the porous silicon membrane is a sensor exhibiting sensing characteristics causing a change in at least one of the optical characteristic, and the electrical characteristic in response to exposure to a targeted fluid or reaction, wherein the substrate comprises an upper substrate member and a lower substrate member, wherein

the source fluid flow channel is within the upper substrate member and the target fluid flow channel is within the lower substrate member, wherein the upper substrate member comprises a first cavity and the lower substrate member a second cavity, and wherein porous silicon membrane is located in a hollow space formed by the first and second cavities .

23. – 30. (Canceled).

31. (Original): The device of Claim 22, further comprising a light source and a detector, the light source and the detector being focused at the cross-channel area.

32. (Currently amended): The device of Claim 22, wherein the thickness of the ~~one or more~~ porous silicon ~~membranes are~~membrane is between 0.01 and 50 micrometers.

33. (Currently amended): The device of claim 22, wherein the ~~one or more~~ porous silicon ~~membranes are~~membrane is capable of fractionating molecules based on size, molecular weight, charges, chemical affinity, or other chemical/physical properties.

34. (Currently amended): The device of Claim 22, wherein the ~~one or more~~ porous ~~membranes are~~silicon membrane is made of a single crystal porous silicon (Psi).

35. (Currently amended): The device of Claim 22, wherein the ~~one or more~~ porous ~~membranes are~~silicon membrane is made of a porous polysilicon (PPSi).

36. (Original): The device of Claim 22, wherein the substrate is made of silicon.

37. (Original): The device of Claim 22, wherein the substrate is made of polydimethyl siloxand (PDMS).

38. (Currently amended): The device of Claim 22, wherein the ~~one or more~~ porous ~~membranes are~~silicon membrane is integral with the substrate.

39. (Original): The device of Claim 22, wherein the device is a disposable device.

40. (Original): The device of Claim 22, wherein the device is a reusable device.

41. – 63. (Canceled).

64. (Previously Presented): The device of Claim 22, wherein each pair of the one or more source and target fluid channels has one source fluid flow channel that crosses over one target fluid flow channel at one cross-channel area.

65. (Currently amended): The device of Claim 1, wherein the porous silicon membrane has a property of being a passive diffusion barrier between the source fluid flow channel and the target fluid flow channel.

66. (Currently amended): The device of Claim 22, wherein the porous silicon membrane has a property of being a passive diffusion barrier between the source fluid flow channel and the target fluid flow channel

67. (Canceled).

68. (Currently amended): ~~The device of claim 1~~ A microfluidic device, comprising:

a source fluid flow channel;

a target fluid flow channel, the target fluid flow channel being in fluid communication with the source fluid flow channel at a cross-channel area, wherein the source fluid flow channel crosses over the target fluid flow channel in an X fashion at the cross-channel area;

a porous membrane separating the source fluid flow channel from the target fluid flow channel in the cross-channel area, wherein the porous membrane comprises a porous silicon membrane;

a substrate comprising an upper substrate member and a lower substrate member; and

a field-force/gradient mechanism proximate the porous silicon membrane, wherein the field-force/gradient mechanism comprises an electric field configured to produce a fluid movement of a fluid from the source fluid flow channel to the target fluid flow channel via the porous silicon membrane located in the cross-channel area,

wherein the porous silicon membrane produces a change in both an optical characteristic and an electrical characteristic of the porous silicon membrane and wherein the porous silicon membrane is a sensor exhibiting sensing characteristics causing a change in at least one of the optical characteristic and the electrical characteristic in response to exposure to a targeted fluid or reaction, wherein the source fluid flow channel is within the upper substrate member and the target fluid flow channel is within the lower substrate member, wherein the upper substrate member comprises a first cavity and the lower substrate member a second cavity, and wherein porous silicon membrane is located in a hollow space formed by the first and second cavities, wherein the porous silicon membrane is an integral part of the substrate.

69. (Currently amended): ~~The device of claim 22~~ A microfluidic device, comprising:

a source fluid flow channel;

a target fluid flow channel, the target fluid flow channel being in fluid communication with the source fluid flow channel at a cross-channel area, wherein the source fluid flow channel crosses over the target fluid flow channel in an X fashion at the cross-channel area;

a porous membrane separating the source fluid flow channel from the target fluid flow channel in the cross-channel area, wherein the porous membrane comprises a porous silicon membrane;

a substrate comprising an upper substrate member and a lower substrate member; and

a field-force/gradient mechanism proximate the porous silicon membrane, wherein the field-force/gradient mechanism comprises an electric field configured to produce a fluid movement of a fluid from the source fluid flow channel to the target fluid flow channel via the porous silicon membrane located in the cross-channel area,

wherein the porous silicon membrane produces a change in both an optical characteristic and an electrical characteristic of the porous silicon membrane and wherein the porous silicon membrane is a sensor exhibiting sensing characteristics causing a

change in at least one of the optical characteristic and the electrical characteristic in response to exposure to a targeted fluid or reaction, wherein the source fluid flow channel is within the upper substrate member and the target fluid flow channel is within the lower substrate member, wherein the upper substrate member comprises a first cavity and the lower substrate member a second cavity, and wherein porous silicon membrane is located in a hollow space formed by the first and second cavities, wherein the porous silicon membrane is an integral part of the substrate.

70. (New) The device of claim 1, wherein the porous membrane consists of a porous silicon membrane.

71. (New) The device of claim 22, wherein the porous membrane consists of a porous silicon membrane.

72. (New) The device of claim 68, wherein the porous membrane consists of a porous silicon membrane.

73. (New) The device of claim 69, wherein the porous membrane consists of a porous silicon membrane.